Shell Exploration & Production

Shell
3601 C Street, Suite 1000
Anchorage, AK 99503
Tel. (907) 646-7112
Email Susan.Childs@Shell.com
Internet http://www.Shell.com/

OCS/PSD Air Quality Permits
U.S. EPA – Region 10, AWT-107
1200 6th Avenue, Suite 900
Seattle, WA 98101
Facsimile no. 206-553-0100
Email: R10OCSAirPermits_Reports@epa.gov

June 5, 2012

Re: **Shell OCS Exploration Program**
$PM_{2.5}$ Speciation Monitoring on the Beaufort and Chukchi Seas
Response to Sampling Frequency Requests

On March 19, 2012, Shell Gulf of Mexico, Inc. and Shell Offshore, Inc. (hereafter, collectively, Shell) received a letter from Mr. Krishna Viswanathan with the U.S. Environmental Protection Agency (EPA) regarding an issue preventing final approval of the Shell $PM_{2.5}$ Speciation Monitoring Program for the Beaufort and Chukchi Seas (Attachment 1). In that letter, EPA requests (as reiterated below) that Shell provide additional information supporting an every sixth day sampling schedule instead of an every three day schedule as requested by EPA:

> *Specifically, EPA requests that Shell provide a summary of the problems that do not allow for the operation of these speciation samplers on the Alaskan North Slope, for the frequency that EPA believes is necessary in order to meet the monitoring objectives.*

In the information that follows, Shell provides background on this issue, a response to the EPA rationale for an every three day sampling schedule, and the requested summary descriptions of problems encountered in the design and operation of the $PM_{2.5}$ speciation sampling program utilizing that schedule.

Based on this information, Shell believes that a collection frequency of every six days can reasonably be expected to meet the EPA stated monitoring objective of characterizing Alaskan North Slope $PM_{2.5}$ concentrations and that an every third day schedule is not necessary. Shell will continue to monitor $PM_{2.5}$ speciation at Wainwright and Deadhorse on a one-in-six day schedule as originally proposed in Version 1.0 of the Quality Assurance Project Plan Addendum for the Discoverer $PM_{2.5}$ Speciation Monitoring Program.

Revision 1.1 of the Quality Assurance Project Plan Addendum for the Discoverer $PM_{2.5}$ Speciation Monitoring Program is enclosed with this submission. This revision addresses the comments EPA provided to Shell on January 31, 2012 and represents the final plan for the project.

Thank you,

Susan Childs
Alaska Venture Support Integrator, Manager

Enclosure: Quality Assurance Project Plan Addendum for the Discoverer $PM_{2.5}$ Speciation Monitoring Program

Cc:
Pauline Ruddy, Shell
Chris Lindsey, Shell
Lance Tolson, Shell
Natasha Greaves, EPA Region 10
Chris Hall, EPA Region 10
Krishna Viswanathan, EPA Region 10
John Pavitt, EPA Region 10/Alaska

Background

Post-construction ambient air quality monitoring is required under Section R and Section S of Permit to Construct No. R10OCS/PSD-AK-09-01 and R10OCS/PSD-AK-2010-01, respectively. Under each section, Shell is required to analyze samples to determine the chemical speciation of $PM_{2.5}$ constituents in accordance with EPA, 1984a: *Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)*, EPA-450/4-87-007, May 1987 (the *Guidelines*). On January 13, 2012, Shell submitted to EPA the *Quality Assurance Project Plan Addendum for the Discoverer PM2.5 Speciation Monitoring Program* (the *Plan*). In Section B1 of the *Plan*, Shell states that a less frequent monitoring schedule is appropriate given the low concentrations expected for the program:

> *EPA [Speciation Trends Network] samples are collected on a once every three day or once every six day schedule all year-round to assess national trends in background concentrations. Higher frequency sampling schedule is generally followed by locations where $PM_{2.5}$ concentrations tend to be relatively high or pose a health concern. Because observed $PM_{2.5}$ mass concentrations along the Chukchi and Beaufort Seas have historically been very low, the project adopts a one sample every six day frequency and schedule.*

This basis for an every sixth day monitoring schedule because of expected low concentration levels is consistent with the EPA *Guidelines*. In Section 2.7 of the *Guidelines*, EPA provides guidance for frequency of sampling for particulate matter less than 10 microns (PM_{10}).

> *The sampling frequency for PM_{10} samplers is determined by the PM_{10}, PM_{15}, or TSP concentrations relative to the PM_{10} [National Ambient Air Quality Standards] NAAQS.*
>
> *If these estimated concentrations were < 80 percent of the PM10 NAAQS, then a minimum of one sample every 6 days would be required for PM_{10} monitors;*

On January 31, 2012, Shell received a letter from Mr. Chris Hall with comments regarding the *Plan* that included a request to monitor $PM_{2.5}$ speciation on an every third day schedule.

> 6) *<u>Section B1, pg 17</u>: To be able to adequately characterize the particulate pollutant plume and to be able to model secondary $PM_{2.5}$ formation Region 10 is requesting that SOI commit to a 1/3 day sampling for the first year of operation in order to build a robust data set for future characterization and modeling purposes.*

On Feb 16th and February 28th, 2012, Shell contacted EPA by phone and provided justification to continue to conduct $PM_{2.5}$ speciation sampling every sixth day as stated in the *Plan*. EPA has subsequently provided a sampling schedule rationale for a proposed collection frequency every third day in the previously referenced March 19, 2012 letter from Mr. Viswanthan. Shell is herein providing direct responses to the EPA sampling schedule rationale.

EPA Rationale

The need to obtain a large data set as soon as practicable. $PM_{2.5}$ speciated data has never been collected on the Alaskan North Slope and it is important to collect as much speciated data as possible during exploratory drilling operations.

Shell Response

A large data set for this monitoring program will likely not provide a reliable data set for characterizing the exploratory drilling operations on the Alaska North Slope. Historical data collected along the Alaska North Slope indicates $PM_{2.5}$ concentrations are low and near measurement detection levels. Initial data collected by this $PM_{2.5}$ speciation program also demonstrate concentrations are very low in the region.

The closest exploratory drilling project proposed in the Beaufort Sea is more than 13 miles from the nearest $PM_{2.5}$ speciation monitoring station. Local villages with diesel fueled internal combustion engines, gasoline fueled automobiles, and other industrial sources of $PM_{2.5}$ emissions are considerably closer to the monitoring stations than the proposed exploratory drilling operations. There is no expectation that the drilling projects will cause a measureable impact amongst the other particulate sources in the area. Any impacts from the exploratory drilling operations would be masked and indistinguishable from these other local sources of particulate emissions which are shown to be at or near measurement detection levels.

For these reasons, Shell believes that sampling on a one-in-six day schedule will adequately define the annual mean and variability of the baseline for the villages.

EPA Rationale

Operating on an every third day schedule would allow for receptor modeling after the first year. With an every sixth day schedule, we would have to wait two years to run this analysis.

Shell Response

The air quality permits were issued in part, based on demonstrated compliance with the $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS). No $PM_{2.5}$ speciation monitoring was conducted as part of this demonstration. The $PM_{2.5}$ speciation monitoring requested by EPA is post-construction monitoring which is typically conducted to demonstrate that no unexpected impacts occur as a result of the permitted activities. The EPA rationale implies that the intent of the stated receptor modeling is to assess potential impacts associated with the permitted activities. However, given that no previous speciation monitoring took place to establish baseline concentrations, and that the monitoring station is located within a village with multiple emission sources for which impacts cannot be differentiated from project impacts, Shell would maintain any initial findings from any receptor modeling based on this speciation monitoring would be inconclusive, at best. At most, the $PM_{2.5}$ speciation sampling will provide information on the baseline in the two villages in this area, which could be accomplished with an every sixth day sampling schedule.

EPA Rationale

The larger the data set the more robust the modeling results. Speciated data would be used in the Title V Air Quality Operating Permit modeling analyses to show compliance with the National Ambient Air Quality Standards.

Shell Response

National Ambient Air Quality Standards address only the $PM_{2.5}$ total mass priority pollutant and not the speciated elements contributing to that mass. If $PM_{2.5}$ speciated data were to be considered in any modeling analyses intended to determine compliance with the NAAQS, the expectation is that the impact of any secondary PM aerosol formation would be very small. This expectation is based on the already documented low ambient $PM_{2.5}$ concentrations (<5 $\mu g/m^3$) as compared to the annual and 24-hour average $PM_{2.5}$ NAAQS limits of 15 $\mu g/m^3$ and 35 $\mu g/m^3$ respectively.

EPA Rationale

Speciated data makes secondary $PM_{2.5}$ aerosol modeling more reliable. $PM_{2.5}$ speciated data would allow for more precise modeling of total ambient $PM_{2.5}$ on the Alaskan North Slope (both direct and secondary).

Shell Response

Monitoring data to date indicate that ambient daily 24 hour average $PM_{2.5}$ concentrations on the North Slope (using Wainwright and Deadhorse data) average less than 5 $\mu g/m^3$. This level is only slightly above the measurement methodology detection limits. Data collected near a measurement method limit of detection, by definition, contain a larger uncertainty factor. This fact is demonstrated in the preliminary data already obtained by the project. During the first quarter of sampling, a general trend in the data has been observed where the accumulative concentrations of the individual parameters exceeded the $PM_{2.5}$ total mass measurement. Theoretically, the accumulated concentrations of all the parameters should be less than or equal to the total mass measurement. After careful review of the data, it was concluded that the uncertainties of each measurement, particularly at such low ambient concentrations, contributed to this observation. The desire for more precise modeling is countered by the fact that the very low background concentrations used to support the modeling is of higher uncertainty.

EPA Rationale

Greater chance to collect one or more samples during an elevated PM episode. The odds of missing a PM episode or collecting just one sample are much greater with an every sixth day sampling schedule.

Shell Response

While intuitively, a doubling of the odds to potentially capture an event would be a desirable thing, the fact remains that increasing the sampling schedule to once every three days increases the odds of collecting samples during a possible PM episode to a still relatively improbable 33%. Monitoring data to date indicate that ambient 24-hour average PM_{25} concentrations at Wainwright and Deadhorse average less than 5 $\mu g/m^3$. Even when using continuous PM samplers, very few elevated PM episodes have been observed throughout the monitoring history at Deadhorse and Wainwright.

EPA has indicated previously that the PM_{25} speciation monitoring that is required for the Noble Discoverer operations is designed to characterize background PM_{25} concentrations. Given the infrequency of PM episodes, statistically such an occurrence should be considered an anomaly and data associated with such an event would be considered informational rather than an indication of general ambient air quality background concentration. Therefore, increasing the sample collection frequency essentially amounts to designing a background monitoring program to collect data on anomalies, a choice that is counter to the monitoring goals associated with a background characterization program.

EPA Rationale

Every third day sampling allows for more site visits and quicker identification of monitor issues which are more prevalent in harsh environments.

Shell Response

A false assumption is made that visits by site technicians are the primary mechanism for identifying and responding to sampler issues. Local site technicians generally available at the monitoring locations have very limited air quality training and skills to provide on-site assistance. Site technicians are for the most part general laborers who are available for limited times due to already having a full time employment elsewhere in these communities. Because the majority of employment opportunities are centered on oil-field operations, most personnel available in the communities are working schedules with very long shifts, and then leaving the communities for extended periods of off-shift time. Because of this transient, limited-trained workforce, other mechanisms are relied upon as the primary mechanism for identifying problems.

Shell, through its monitoring partner SLR International Corp has implemented remote diagnostic capabilities at all monitoring stations. These capabilities are seldom, if ever, implemented outside of Alaska North Slope monitoring. Using advanced air quality technology, monitoring experts from SLR examine equipment conditions on a daily basis from their Anchorage or Fairbanks-based operations. While expedited response to identified problems is limited due to the remote nature of the station, the ability to identify problems, and ultimately correct them on a fairly timely basis is far more successful with this model than when using the current pool of on-site site technicians.

Summary of Problems for Speciation Sampling

As requested, Shell is providing a summary of problems associated with speciation sampling on the Alaskan North Slope. These problems, while significant during operations involving an every six day sampling schedule, are exacerbated by the more frequent $PM_{2.5}$ speciation monitoring schedule of every third day requested by EPA.

1. Communities in which sampling occurs do not have local air quality experts available to effectively support increased monitoring frequencies.

   Local site technicians available at remote monitoring locations such as Wainwright have very limited training and skills to provide on-site assistance with air monitoring programs. While personnel with sufficient skill to assist with air monitoring work are available within the community of Deadhorse, these individuals already have full time employment elsewhere in the community, generally as specialized consultants and/or general laborers supporting oil-field operations. These individuals tend to work long rotation shifts, and then leave the communities for extended off-shift periods. In addition, a higher transient turn-over rate within Deadhorse requires more people and resources to maintain basic operations. This schedule structure makes these individuals relatively unreliable for supporting a program of continual or frequent monitoring. Increasing the frequency of sampling only increases the likelihood that a conflict will arise between the monitoring program and their on-going responsibilities and commitments elsewhere in the community.

   Because of the lack of specialized personnel available to support the monitoring program, special sample handling procedures have been developed to improve the chances of success. Sample canisters must be set up by SLR in Fairbanks or Anchorage and sent to the site operators for loading in samplers. This added step reduces the amount of time that is required of field staff to support the sampling program as well as assists in avoiding contamination or other handling problems associated with using minimally-trained technicians. However, this requirement further exacerbates the problem associated with shipment reliability (see Item 2 below) because sample shipments are larger, heavier, and more likely to be decreased in priority by the shipping companies. Increasing the frequency of sampling further necessitates the need to set up sampling canisters on behalf of the site operators to keep their time commitment to support the program minimized. However, increasing the sampling frequency will likely increase the risk of lost or delayed shipments.

   Because local personnel are not immediately available in the community, specially trained air quality staff is deployed to the site on an as-needed basis to respond to problems. Deployment of trained air quality staff to correct problems is subject to issues such as travel distance and limited travel options. Response times for a non-health emergency can routinely take 3 or 4 days to remote communities such as Wainwright. Increased sampling frequency therefore directly correlates to increased probability of sampling problems requiring a response, with the limitations inherent in the timeliness of that response as outlined. While it would seem that having more scheduled samples increases the likelihood that the project will meet data completeness objectives

because each lost sample has a smaller impact on the overall completeness assessment, an increased sampling frequency also means more samples could be compromised before trained air quality staff could deploy and respond to problems. Further, the increased sampling frequency then reduces the amount of time between sampling events when make-up samples could be collected as substitutes after corrective action has been taken to resolve any issues. The net result is that a higher frequency sampling program (one sample every three days) is more likely to experience difficulties achieving data completeness objectives than the less frequent sampling program (one sample every six days).

2. Remote North Slope locations could make increased sample shipments unreliable.

   Most North Slope communities are served exclusively by air cargo because limited or no ground transportation is available. When harsh weather conditions occur that cause delays in flights on the North Slope, carriers prioritize and limit air cargo to food, medical, or emergency supplies until conditions improve enough to resume routine operations. Consequently, air quality samples may become the lowest priority item shipped. Increased sampling frequency will require more materials to be shipped that will compete for already limited shipping resources. Since beginning sampling in January 2012, the speciation project has experienced three delayed shipments due to limited space on small aircraft required to transport goods in and out of the communities. It is reasonable to expect more delays will be experienced as the project continues.

   Sample integrity is compromised when shipments are delayed. Cargo, by necessity on the North Slope, is kept in heated warehouses while awaiting shipment. When shipments are delayed, samples easily can warm above the 4 °C sample holding temperature requirement before arrival at the lab for analysis. Adding additional ice-packs to counter this effect increases shipment size and consequently further adds to the likelihood that it will be delayed in favor of higher priority cargo.

3. Harsh environmental conditions increase likelihood that samplers will fail to collect valid samples.

   Since beginning sampling in January 2012, three sampling events were lost or impacted due to severe icing. Increased sampling frequency increases the number of sampling events that will predictably be impacted and reduces the ability to schedule make-up sampling events between normally scheduled sampling events. The project can reasonably expect to fail to meet the specified data completeness measurement objectives without the ability to incorporate make-up sampling events.

4. Speciation data can reasonably be predicted to be of low perceived value.

   Given the well documented low $PM_{2.5}$ concentrations on the North Slope, as stated previously speciation data are expected to further demonstrate that ambient $PM_{2.5}$ concentrations and associated speciated parameter concentrations remain near or below detectable concentrations. Typical Data Quality Objective (DQO) assessments of precision and bias are based on the

standard deviation of those measurements. At low concentrations, data quality evaluations become more difficult and on the surface appear to be of poor quality due to the exaggerated relative uncertainties associated with low concentrations. It is reasonable to predict in advance of any data collection effort, based on historical $PM_{2.5}$ mass data, that the speciation data will exhibit these characteristics and the data will be valued lower when assessed against DQOs typical of air monitoring programs.

5. Speciation monitoring program costs are considerably higher than other ambient air monitoring programs.

   To implement risk-mitigation measures to reasonably address Items 1 through 3 above, the program cost is roughly $1,300 per sample. Increasing the sampling frequency from 1 sample every 6 days to 1 sample every 3 days will likely increase the program cost by roughly $100,000 at each monitoring location. Given the remaining low probability of detecting significant PM episodes and the inescapable high measurement uncertainty, an increased monitoring frequency does not appear to justify this increased cost, as it does not appear it will provide valuable additional data. The every sixth day schedule is adequate to meet the only relatively attainable purpose, which is to statistically characterize the baseline in the two villages.